

EXECUTIVE SUMMARY

Urban Planning Zones S-1, S-2, S-3 and a portion of S-5 have been identified as part of the Tier I growth area by the Lincoln-Lancaster County Comprehensive Plan. This means they are expected to become developed within the next 25 years. These Urban Planning Zones are called the Southeast Upper Salt Creek Watershed.

GOALS AND OBJECTIVES

Successful master planning for stormwater management involves identifying issues, establishing goals, and preparing a plan to meet those goals. Public involvement in each of these areas is key to developing support for the Master Plan. Recognizing this, four open houses were held by the City of Lincoln Public Works and Utilities Department and the Lower Platte South Natural Resources District. The purpose of these forums was to gather public input on existing conditions, present study findings on existing and projected conditions, present and receive feedback on potential proposed concept components, determine the degree of public support for those concepts, present opinions of probable costs and relative benefits of two concept master plan alternatives, and determine the preferred alternative.

Some of the key issues that were identified through the watershed master planning process follow:

- Stream stability and management of increased volume and runoff due to urbanization and development in the watershed
- Increased flood hazard and risk due to development in the floodplain
- Evaluation of runoff quantity and quality on wetlands and other environmental resources
- Road crossings, existing development in the floodplain and private property rights
- Funding and coordination with floodplain regulation review
- Evaluating and improving upland land use and water quality during and after development
- Management of runoff and drainage into Wilderness Park
- Lack of delineated floodplain in the watershed

The following goals were identified through the public involvement process:

- Preserve stream bed and banks that are stable, and improve stability of those at risk
- Reduce flood hazard to existing and future buildings and to infrastructure
- Coordinate components to provide multi-purpose use potential
- Improve water quality and preserve or restore instream and riparian habitat
- Identify funding opportunities

The recommended master plan components discussed in this report have been selected to attain those goals. They have been analyzed to determine the degree to which they attain the goals and solve the problems, or take advantage of the opportunities presented in the Southeast Upper Salt Creek (SEUSC) Watershed.

EVALUATION

Stormwater Quality

Current threats to stormwater quality in the SEUSC Watershed are runoff from adjacent crop ground, sediment from stream bed bank erosion, and potential runoff from failed or poorly maintained individual sanitary septic systems. Projected conditions will exacerbate the water quality threats from adjacent land uses and increase stream bank erosion unless sufficient riparian buffers are established or preserved to filter pollutants from adjacent land uses and flow increases are mitigated. This could be accomplished by preserving the existing 100-year flood prone area or through a combination of regional detention and preserving a portion of the floodplain.

Stream Stability

Some channel bed erosion and bank sloughing is occurring near the mouth of the S-1 watershed west of 14th Street, and is evident in S-5 in the two artificial channels between South 38th Street and the BNSF Railroad ditch. The channel has scoured several feet in the southern channel. Stream velocities are at or above erosive velocities for existing and projected conditions. Development, to date, in the S-3 watershed has not caused significant stormwater impacts on downstream reaches because of the low density and low percent impervious area associated with large lot acreages. Some channel bed erosion and bank sloughing is occurring near the mouth of the S-2 watershed west of the BNSF Railroad.

Erosion caused by increased flow rates, and increased occurrence of bankfull conditions due to projected development, will increase if not adequately addressed. Land disturbance activities associated with projected development could also adversely affect surface water quality if appropriate Best Management Practices (BMPs) are not installed and maintained. A bioengineering approach is the preferred solution. If properly designed, it would be appropriate for most channel reaches.

Construction sites in the basin can be a significant source of erosion and sediment. Development in the upper portion of S-1 is currently underway. Erosion and sediment control plans have been prepared and implemented. Joint City of Lincoln and NRD education and enforcement efforts have increased citizen and developer awareness. Citizen and developer awareness has improved compliance with city, state, and federal erosion and sediment control regulations for development. Erosion and sediment control in the rest of the watershed will benefit from increased City of Lincoln and NRD staffing that will help education, compliance and enforcement activities required by the Municipal NPDES Permit.

Flooding Along Streams and Channels

The SEUSC Watershed is approximately 50% developed. New and pending developments near South 27th Street and Yankee Hill Road have been developed according to the 2000 Lincoln Drainage Criteria Manual (DCM), reducing the flood hazard to adjacent property.

The rest of the watershed has existing flood hazard concerns that will increase unless master plan components are built that mitigate the effects of projected development, see Table ES-4. Currently, nine houses and several empty lots are in or near the 100-year floodprone area. As the basin develops, flow rates will increase 40-45% for the 2-year, 15-20% for the 10-year, and 10-20% for the 100-year events if floodplain storage outside of the required minimum flood corridor is eliminated, unless the lost storage is mitigated elsewhere in the watershed. Without intervention by application of stormwater management practices, the mainstem surface profiles between the BNSF Railroad and 40th Street would increase by 3 to 5 ft, which could result in flood damage and significantly higher road and bridge replacement or upgrade costs. Channel velocities and depth of flow will also increase, aggravating existing or instigating new channel stability problems in affected reaches.

Most bridges and culverts in the watershed are undersized and do not meet current hydraulic design standards. However, recently constructed bridges and culverts on arterials such as Yankee Hill Road and South 56th Street are not undersized. Other structures should be prioritized and replaced as opportunity presents itself. The proposed road dams on Rokeby Road near 70th Street would reduce flow rates in the upper portion of S-2/S-3 enough to reduce the flood hazard to the ten houses, bring one culvert into hydraulic compliance and reduce replacement costs slightly on another culvert on the mainstem. Tables ES-1, ES-2, and ES-3 show the 2-, 10-, and 100-year peak flow rate values at selected locations for existing, projected, and conditions based upon implementation of the Southeast Upper Salt Creek Watershed Plan.

Table ES-1
2-Year Peak Flow Rate Values at Selected Locations

Location	Model Element		Existing	Projected		Recommended Master Plan	
	HEC-1	HEC-RAS	Q-cfs	Q-cfs	% Change	Q-cfs	% Change
Mainstem							
Rokeyby Road	202	25,159	177	157	-11%	42	-76%
South 66 th Street	66TH	24,449	169	150	-11%	41	-76%
South 56 th Street	56THB	20,036	545	489	-10%	352	-35%
Cromwell Road	NODE62	17,440	734	687	-6%	554	-25%
South 40 th Street	40THB	12,655	908	934	3%	739	-19%
Tributary Confluence	NODE25	8,707	1,249	1,748	40%	1,491	19%
Rokeyby Road	ROKEBY	6,395	1,383	1,984	43%	1,674	21%
South 27 th Street	27THB	3,607	1,430	2,080	45%	1,648	15%
BNSF Railroad	BNSF	2,600	1,427	2,073	45%	1,827	28%
Salt Creek	R6A	2,491	1,427	2,057	44%	1,822	28%
Northeast Tributary							
Rebel Drive	REBEL	9,430	257	257	0%	257	0%
South 56 th Street	56THA	8,265	179	179	0%	179	0%
South 53 rd Street	S53RD	7,195	178	178	0%	178	0%
Private Drive	R22	6,120	275	275	0%	275	0%
Private Drive	R22	5,670	275	275	0%	275	0%
Southwest Tributary							
South 40 th Street	S2T	500	233	419	80%	419	80%
Southcentral Trib.							
New Castle Road	CLV310	310	164	164	0%	164	0%
Southeast Tributary							
Rokeyby Road	201	464	243	206	-15%	134	-45%
Northwest Tributary							
Yankee Hill Road	YANKB	5,700	167	167	0%	167	0%
South 40 th Street	40THA	3,875	253	332	31%	332	31%
Saltillo Road	SALTIL	1,466	637	1,062	67%	1,037	63%
So. 38 th St. (north)	S38TH	7,280	322	428	33%	408	27%
So. 38 th St. (south)	S5E	3,706	120	203	69%	59	-51%

Table ES-2
10-Year Peak Flow Rate Values at Selected Locations

Location	Model Element		Existing	Projected		Recommended Master Plan	
	HEC-1	HEC-RAS	Q-cfs	Q-cfs	% Change	Q-cfs	% Change
Mainstem							
Rokeyby Road	202	25,159	341	319	-6%	47	-86%
South 66 th Street	66TH	24,449	344	325	-6%	47	-86%
South 56 th Street	56THB	20,036	1,200	1,164	-3%	821	-32%
Cromwell Road	NODE62	17,440	1,557	1,525	-2%	1,209	-22%
South 40 th Street	40THB	12,655	2,216	2,286	3%	1,880	-15%
Tributary Confluence	NODE25	8,707	3,193	3,634	14%	2,989	-6%
Rokeyby Road	ROKEBY	6,395	3,387	4,039	19%	3,299	-3%
South 27 th Street	27THB	3,607	3,519	4,309	22%	3,430	-3%
BNSF Railroad	BNSF	2,600	3,500	4,311	23%	3,658	5%
Salt Creek	R6A	2,491	3,500	4,325	24%	3,648	4%
Northeast Tributary							
Rebel Drive	REBEL	9,430	612	612	0%	612	0%
South 56 th Street	56THA	8,265	609	609	0%	609	0%
South 53 rd Street	S53RD	7,195	533	533	0%	533	0%
Private Drive	R22	6,120	700	700	0%	700	0%
Private Drive	R22	5,670	700	700	0%	700	0%
Southwest Tributary							
South 40 th Street	S2T	500	471	766	63%	766	63%
Southcentral Trib.							
New Castle Road	CLV310	310	328	328	0%	328	0%
Southeast Tributary							
Rokeyby Road	201	464	506	461	-9%	251	-50%
Northwest Tributary							
Yankee Hill Road	YANKB	5,700	371	371	0%	371	0%
South 40 th Street	40THA	3,875	507	6	-99%	612	21%
Saltillo Road	SALTIL	1,466	1,445	2,151	49%	2,043	41%
So. 38 th St. (north)	S38TH	7,280	660	855	30%	786	19%
So. 38 th St. (south)	S5E	3,706	257	613	139%	168	-35%

**Table ES-3
100-Year Peak Flow Rate Values at Selected Locations**

Location	Model Element		Existing	Projected		Recommended Master Plan	
	HEC-1	HEC-RAS	Q-cfs	Q-cfs	% Change	Q-cfs	% Change
Mainstem							
Rokeby Road	202	25,159	537	517	-4%	51	-91%
South 66 th Street	66 TH	24,449	535	516	-4%	51	-90%
South 56 th Street	56THB	20,036	2,004	1,992	-1%	1,411	-30%
Cromwell Road	NODE62	17,440	2,668	2,639	-1%	2,050	-23%
South 40 th Street	40THB	12,655	3,933	4,031	2%	3,212	-18%
Tributary Confluence	NODE25	8,707	5,734	6,217	8%	5,138	-10%
Rokeby Road	ROKEBY	6,395	6,141	6,934	13%	5,667	-8%
South 27 th Street	27THB	3,607	6,468	7,564	17%	5,927	-8%
BNSF Railroad	BNSF	2,600	6,441	7,495	16%	5,328	-17%
Salt Creek	R6A	2,491	6,441	7,574	18%	5,307	-18%
Northeast Tributary							
Rebel Drive	REBEL	9,430	1,075	1,075	0%	1,075	0%
South 56 th Street	56THA	8,265	1,042	1,042	0%	1,042	0%
South 53 rd Street	S53RD	7,195	830	830	0%	830	0%
Private Drive	R22	6,120	1,136	1,136	0%	1,136	0%
Private Drive	R22	5,670	1,136	1,136	0%	1,136	0%
Southwest Tributary							
South 40 th Street	S2T	500	762	1,175	54%	1,175	54%
Southcentral Trib.							
New Castle Road	CLV310	310	488	488	0%	488	0%
Southeast Tributary							
Rokeby Road	201	464	827	796	-4%	796	-4%
Northwest Tributary							
Yankee Hill Road	YANKB	5,700	639	639	0%	639	0%
South 40 th Street	40THA	3,875	814	929	14%	929	14%
Saltillo Road	SALTIL	1,466	2,454	3,485	42%	3,281	34%
So. 38 th St. (north)	S38TH	7,280	1,140	1,481	30%	1,253	10%
So. 38 th St. (south)	S5E	3,706	428	613	43%	467	9%

SOUTHEAST UPPER SALT CREEK WATERSHED PLAN

The Southeast Upper Salt Creek Watershed Plan evolved from a public process that examined two alternative concept master plans. Concept Plan A can be categorized as preserving the existing 100-year floodplain, while Concept Plan B can be categorized as preserving a 400-ft flood corridor within the 100-year floodplain, supplemented by stormwater storage facilities. **The Southeast Upper Salt Creek Watershed Plan reflects Concept Plan A.**

Concept Plan A - Preserve Existing Floodplain - \$8,424,000

The components of Concept Plan A include preservation of the existing 100-year floodplain from below South 70th Street to the Salt Creek floodplain delineated limits, construction of three detention facilities, construction of water quality wetlands in the preserved floodplain at subbasin outlets, use of bioengineering approaches to improve stream stability, and replacement of undersized bridges and culverts (see Figure ES-1, "Master Plan Major Capital Cost Components"). Refer to Figures MP-22A through MP-22o in the master plan document for site details, and to Table ES-4 for opinions of probable cost for Concept Master Plan A. This concept plan would meet the stormwater management goals established for this watershed, and would require 405 acres of land rights acquisition.

Concept Plan B - Preserve a Flood Corridor with Regional Storage Facilities - \$12,082,000

The components of Concept Plan B include preservation of a flood corridor from below South 70th Street to the Salt Creek Floodplain delineated limits, a 400-ft flood corridor below South 40th Street, preserving the existing flood corridor along streams upstream of South 40th Street and on the tributaries, construction of a regional storage facility west of South 40th Street on a tributary, construction of four other detention facilities, construction of water quality wetlands outside the preserved floodplain at subbasin outlets, use of bioengineering approaches to improve stream stability, and replacement of undersized bridges and culverts (see Figure MP-21 "Concept Master Plan B Potential Component Locations" in the master plan document). Refer to Figures MP-22A through MP-22o in the master plan document for site details, and to Table MP-23 in the master plan document for opinions of probable cost for Concept Master Plan B. The combination of stormwater storage, 400-ft flood corridor, and proposed bridges would provide a 100-year water surface profile similar to the water surface profile for preservation of the existing 100-year floodplain. This concept plan would require land rights acquisition of 396 acres of Tier 1 area. The loss of 100-year floodplain areas outside the minimum flood corridor with this concept would require an additional \$3.7 million to meet the water quality goals established for this watershed. Thus, Concept B would only be acceptable if private development were to complete the water quality improvements needed to offset the impacts to water quality caused by development.

Both Concept Plan A and Concept Plan B would meet the goals to preserve stream bed and banks that are stable and improve stability of those at risk, reduce flood hazard to existing and future buildings and infrastructure, provide opportunities for multi-purpose use potential, and preserve or restore instream or riparian habitat. However, Concept Plan B would be significantly more expensive, estimated to cost \$3.7 million more than Concept Plan A to provide the same relative water quantity and quality benefits. Concept Plan A allows for protection of the 100-year floodplain and the construction of water quality wetlands in the lower portion of the subbasins. In doing so, Concept Plan A meets all of the stormwater management goals established for this watershed at a significantly lower cost than the alternative plan; thus, was the alternative recommended for the SEUSC Watershed Master Plan.

Capital project components identified in the master plan are generally included in order to meet City of Lincoln design standards and/or to accommodate future urban growth projected for the basins in the SEUSC Watershed. In some cases, the magnitude of the project also reflects the results of more detailed hydrologic and hydraulic modeling completed with HEC-1 and HEC-RAS. It is recognized that prior to areas within the watershed being annexed to the City, the county may have a need to construct improvements in these locations, and that these locations may not reflect the standards identified in the master plan. In these cases, it is anticipated that such components would be upgraded in the future by the City of Lincoln.

Estimated costs for potential bridge and culvert improvements are not included within the total costs estimated to implement the SEUSC Watershed Master Plan. Drainage improvements associated with arterial streets are anticipated to be completed with road projects as urban standards are met when these streets are improved from a rural to an urban cross-section in the future. Likewise, improvements associated with local streets within existing acreage developments are expected to occur when street improvements are made to these areas in the future. For information purposes, estimated costs for bridge and culvert improvements are included in Table MP-15 on pages 108-109, but these costs are not included within total costs listed in the SEUSC Master Plan Performance Matrix on page ES-5 and page 125.

Those areas identified as Low Density Residential in the Future Land Use Plan are already developed, and are expected to remain low density residential even beyond the 25-year planning period. While there may be individual 3-acre parcels in this area which are subdivided in the future, no significant redevelopment of this area into urban land use is anticipated. The Master Plan assumes that the 100-year floodplain within Low Density Residential areas is at low risk of being impacted by future land subdivisions, which would be anticipated to be generally compatible with continued preservation of the floodplain. Thus, costs for acquisition of 100-year floodplain within Low Density Residential areas is not included within the costs identified for implementation of the Master Plan. A more detailed comparison of Concept Plans A and B can be found in the Concept Master Plan Alternatives section, which begins on page 120.

Table ES-4
SEUSC Master Plan Performance Matrix

Goals - Preserve stream bed and banks that are stable, and improve stability of those at risk					
- Reduce flood hazard to existing and future buildings and infrastructure					
- Coordinate components to provide multi-purpose use potential					
- Improve water quality and preserve or restore instream and riparian habitat					
- Identify funding opportunities					
Objective	Master Plan Component	Recommended Plan			Cost
		Performance	Cost		
		High	Med	Low	
Stream Stability					
Maintain existing flood profiles	Preserve floodplain to limits of existing 100-year flood	X			n/a
Preserve stream geomorphology	Preserve floodplain to limits of existing 100-year flood	X			n/a
Increase stream bed and bank stability	Apply bioengineering approach for stream bed and bank stability measures	X			\$2,633,000
Subtotal					\$2,633,000
Flood Hazard Reduction					
Determine flood hazard and reduce hazard for existing development	Build sites S-202, S-2AF and S-5E	X			\$1,604,000
	Build on-site detention				\$0
Reduce hazard to future development	Preserve floodplain to limits of existing 100-year flood	X			\$3,420,000
Reduce public responsibility for flood damage repair	Encourage flood hazard insurance for homes and buildings in the 100-year floodprone area		X		
Determine incremental impact of subdivisions	Require submittal of hydrologic and hydraulic analysis in a consistent format for use by PW&U	X			\$0
Subtotal					\$5,024,000
Multi-Purpose Use Potential					
Provide components that facilitate multiple use	Preserve a corridor wide enough to accommodate hiker/biker paths and provide opportunity for riparian wildlife habitat	X			n/a
Subtotal					\$0
Water Quality Improvement					
Remove urban pollutants	Construct water quality wetlands	X			\$767,000
Restore stream to pre-agricultural alignment	Provides adequate room if desired for restoration	X			
Improve instream habitat		X			
Loss of riparian habitat due to development in the floodplain	Preserve a corridor wide enough to provide opportunity for riparian wildlife habitat	X			
Subtotal					\$767,000
Funding					
Provide components that enhance likelihood of funding	Water quality wetlands and preserving existing 100-year floodplain enhance NET Fund and NDEQ § 319 Fund eligibility	X			
Total Master Plan Opinion of Probable Costs					\$8,424,000

Estimated costs for potential bridge and culvert improvements are not included within the total costs estimated to implement the SEUSC Watershed Master Plan. Drainage improvements associated with arterial streets are anticipated to be completed with road projects as urban standards are met when these streets are improved from a rural to an urban cross-section in the future. Likewise, improvements associated with local streets within existing acreage developments are expected to occur when street improvements are made to these areas in the future. For information purposes, estimated costs for bridge and culvert improvements are included in Table MP-15 on pages 108-109, but these costs are not included within total costs listed in the SEUSC Master Plan Performance Matrix on page ES-5 and page 125.

Insert Figure ES-1
Master Plan Major Capital Cost Components